Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2018-0557

Topic # N161-041

Guided Missile Submarine SSGN Seawater System Antifouling

Interphase Materials, Inc.

WHO

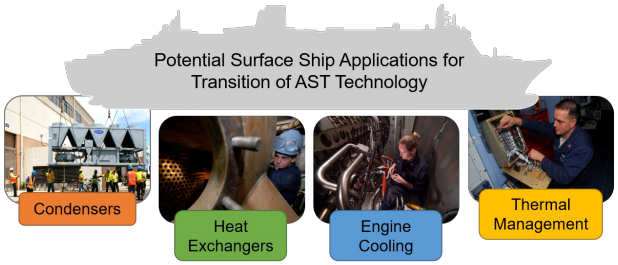
SYSCOM: NAVSEA

Sponsoring Program: SEA07

Transition Target: OHIO class Guided Missile Submarine (SSGN) condensers and heat exchangers

TPOC:
(202)781-1262

Other transition opportunities: Virginia, Seawolf, and Los Angeles Class Submarines, surface ships' heat exchangers (HX), thermal management for avionics and directed energy systems



U.S. Navy images, 100510-N-7629O-003, 090924-N-0120A-008, 180613-N-JO245-078, 090508-N-0096C-012, available at http://www.navy.mil/viewGallery.asp.

Notes: Interphase Materials' antifouling surface treatment (AST) has foreseeable impacts across propulsion and condenser systems throughout the Department of Defense (DoD). Interphase has identified a low-risk path forward for the technology that results in high-impact for the Department of Navy (DoN) and ultimately the DoD. Seawater-cooled heating, ventilation, and air-conditioning (HVAC) systems have similar biofouling issues and costly cleanings as components on submarines. In an HVAC application, the AST could provide immediate efficiency improvements, while demonstrating antifouling properties long-term. Ultimately, the similarity of condensers in HVAC will lend itself to derisk our technology for ultimate transition into surface ships and submarines in the DoN.

As shown in the image, the technology has potential impacts across various systems on a surface ship. Applications that require controlled heating and cooling are targets to transition the technology, as they will provide immediate performance enhancements, and therefore power and cost savings.

WHAT

Operational Need and Improvement: Interphase responded to the Naval Sea Systems Command's (NAVSEA's) and Program Management Sea's (PMS's) 392 interest in seawater system antifouling methods for submarine propulsion cooling systems' condensers and heat exchangers. Interphase proposed a unique approach by applying its AST to prevent biofouling on seawater cooled heat exchangers (HXs). Current antifouling methods employed on submarines have proven to be effective at minimizing fouling but have also proven to be costly to the DoN. Interphase Materials has developed an AST that inhibits biological growth, and therefore reduces high costs associated with ship's force efforts to resolve fouling.

Specifications Required: To demonstrate success for this project, the total ownership costs associated with biofouling maintenance and removal procedures must be a reduction from existing submarine procedures. The design requires the novel solution tie into existing seawater piping systems, while (1) meeting high integrity standards (Submarine Safety Program Requirements), (2) minimizing redesign, (3) passing environmental standards for various operation areas, and (4) demonstrating cost savings compared to cleaning costs of clogged seawater systems.

Technology Developed: Interphase Materials has developed the AST to prevent biofouling on seawater piping systems, condensers, and HXs for OHIO Class SSGNs. The technology is a nano-layer, surface treatment that when applied to components or systems acts as a barrier layer to inhibit biological fouling. The technology is applied via a system flush, allowing the application process to integrate easily into existing systems for a seamless application process during ship availability. Contrary to traditional coating methods, the surface treatment does not require significant application time and has been shown to improve heat transfer by 5-10%.

Warfighter Value: Interphase Materials technology allows ship forces' efforts and resources to be redirected to mission critical assignments. The AST technology increases duration between maintenance intervals, preventing catastrophic component failures, and increasing the operational performance of the asset. The AST has the potential to save $250K per ship annually through reduced cleaning and maintenance costs associated with hydrolancing, acid cleanings, and hazardous waste disposals as a result of biofouling.

WHEN

Contract Number: N00178-18-C-8001 **Ending on:** October 4, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Deployment of Phase II Heat Exchanger Test Rig	N/A	Technology integrates and performs in simulated environment	5	March 2018
Confirmation of AST Performance in Simulated Environment	Med	Quantifiable performance enhancement following AST application	5	September 2018
Extended Duration Performance of AST	Med	Consistent performance enhancement by AST over test duration	6	October 2019

HOW

Projected Business Model: Interphase Materials has the ability to manufacture and produce the AST in-house, as well as apply the technology to systems and components with a team of engineers. Currently, Interphase has the ability to scale the technology and to-date has successfully completed multiple commercial jobs, ranging from component to full-system applications. Interphase Materials is equipped to produce AST materials to treat a 3-million gallon power plant system. Because the AST is prepared in batches for specific jobs, the Interphase team is working towards expanding to full-production scale for future, large-scale operations.

Company Objectives: Interphase Materials intends to further develop and grow the technology for heating and cooling applications across the marine, HVAC, and power industries DoD-wide and commercially. Currently, Interphase Materials is seeking transition opportunities to demonstrate the AST technology on shipboard applications as a pathway to application on SSGN condensers. The company has developed plans for an application on HVAC systems on surface ships to demonstrate heat transfer improvements. The goal of this effort is to immediately impact DoN operations through reduced energy costs, while demonstrating the long-term antifouling benefits of the AST. The team is also interested in discussing new applications for the AST, including thermal management for avionics and directed energy systems.

Potential Commercial Applications: Biofouling, in various forms, takes a toll on water-cooled systems. Interphase Materials has focused on transitioning the technology to applications that experience fouling, such as HVAC and power industries, to improve operational efficiency of these systems. While preventing biofouling, the AST demonstrates an improvement in heat transfer efficiency which translates to cost savings through reduced energy consumption. To date, Interphase Materials has treated multiple heating and cooling systems regionally and internationally with initial results showing significant power and cost savings.

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